



**US Army Corps
of Engineers.**
Construction Engineering
Research Laboratory

Fact Sheet

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GLOBAL/INTERNATIONAL ENVIRONMENTAL SENSITIVITY ANALYSIS

The Problem

The governments of the world are becoming increasingly concerned about the harmful environmental impact resulting from various government agency activities. International laws, regulations, and conventions strive to enforce good environmental decision making. Areas that lie beyond territorial limits (the "Global Commons") are also environmentally regulated by international law and U.S. commitment. In 1978, a Presidential Executive Order made the United States responsible for its international actions that may have an effect on the environment. Ensuing regulations established environmental responsibility in all non-U.S. areas as official Department of Defense and Army policy.

The U.S. Army asked the U.S. Army Construction Engineering Research Laboratory (CERL) to develop a method for evaluating potential environmental risks associated with proposed actions anywhere in the world. This evaluation capability is intended to support the generation of documents similar in format to an Environmental Impact Statement (EIS) that are complete and objective enough to withstand judicial review.

The Technology

CERL has applied the capabilities of Geographical Information Systems (GISs) to the analysis of environmental risk and sensitivity questions. This has been done by using GISs to generate objectively documented background information and management decision tools for environmental compliance outside the territorial limits of the United States.

Geographical Information Systems

GISs are sophisticated computer tools that allow the user to display and manipulate mapped and tabular information in a structured manner. The strength of a GIS is its ability to integrate various types of data into a single analysis framework. In addition, spatial analysis techniques can generate documents that relate directly to the user's environmental concerns.

Data maps

CERL-generated data maps are made available to the public through a Cooperative Research and Development Agreement (CRDA) with Rutgers University. The data maps are popular because they represent the most extensive single-format digital set of environmentally critical data in existence. Currently, over 150 digital maps have been released representing 1.5 gigabytes worth of global data. Types of geographically referenced data include vegetation, soils, watersheds, bioproductivity, threatened species, oceanography, topography, climatology, demographics, economics, cultural concerns, and fisheries.

Analysis Capabilities

1) Global Basins Modeling: CERL has generated the world's first digital basins map. Watershed basins define units in which everything runs downhill. Water is most significant, but other resources are similarly influenced (e.g., soils). These resources help to define the ecological systems present while

rivers flowing through them provide an important transportation system. Rarely is a city not in the vicinity of a major river. Well-defined basins also influence the spread or containment of air pollution. Globally defining the basins provides the means of objectively comparing potential environmental impacts anywhere in the world.

2) Soil Mapping: CERL generated the first global soils map of the world in the standard U.S. Department of Agriculture classification. This allows interpretation of soil characteristics to uses and sensitivities, as is done regularly on a more detailed scale.

3) Analysis of Potential Environmental Risk: Proposed alternative activities can be evaluated and their environmental risks analyzed using a GIS. By shifting the location of proposed activities slightly, the environmental risk may decrease significantly. GIS techniques have the ability to make these comparisons for any location in the world.

4) Visualization: CERL used GIS technology to animate changes in global vegetation production as sensed from satellites.

Benefits/Savings

Application of GIS technology to document environmental risk alternatives outside the U.S. is a cost-effective way to provide an objective and defensible track for the direction an agency has adopted. CERL provides a unique capability because this type of software is usually developed in support of specific projects. In addition, data of interest to the public are made available so that it need not be recollected by other agencies without similar distribution capabilities. The U.S. Army, Navy, and Air Force have already begun to apply this initiative to their specific needs.

Status

CERL is continually advancing its support to decision-makers in the evaluation and documentation of environmental alternatives. During the 1990s, a new generation of satellites are increasing the challenges to digital analysis. This will require more sophisticated GIS tools to efficiently make sense of this massive amount of data. CERL's research is contributing to this effort by developing new GIS tools and data types through a Geographic Research Analysis Support System (see CERL fact sheet CN 12--*Geographic Research Analysis Support System (GRASS)*), *ArcInfo*, and *Imagine* software.

Point of Contact

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Data maps are available from Global Dataset Project, Center for Remote Sensing and Spatial Analysis (CRSSA), Environmental/Natural Resources Bldg, 14 College Farm Rd. Rutgers University, New Brunswick, NJ 08901-8551 USA, telephone (732) 932-1582, FAX: (732) 932-2587, E-mail: global-sales@crssa.rutgers.edu, <http://deathstar.rutgers.edu/global.html>.